

WHAT IS CLAIMED IS:

1. A two level image writer for forming an image from digital data onto a photosensitive medium, said apparatus comprising:
 - an illumination system in a first level for providing incident light beams, said illumination system comprising:
 - a first source for emitting a first polarized light beam having a first color;
 - a second source for emitting a second polarized light beam having a second color;
 - a third source for emitting a third polarized light beam having a third color;
 - fold mirrors for directing each beam to a second level;
 - three polarizing beamsplitters on said second level which receive said polarized beams from said fold mirrors, wherein each polarizing beamsplitter isolates polarization states of each of said first, second, and third polarized light beams;
 - three spatial light modulators on said second level, each comprising an array of pixel sites, wherein each pixel site modulates said first, second, and third polarized light beam from said polarizing beamsplitter prisms to form an array of image pixels according to said digital data; and
 - a dichroic combiner for combining said three modulated light beams into a single writing beam.
2. A two level image writer as in claim 1 wherein said spatial light modulators are reflective Liquid Crystal Devices (LCD).
3. A two level image writer as in claim 1 wherein said spatial light modulators are transmissive Liquid Crystal Devices (LCD).
4. A two level image writer as in claim 1 wherein said first, second, and third light sources comprise a collimator, uniformizer and polarizer.

5. A two level image writer as in claim 1 wherein said spatial light modulators are gated light valves.

6. A two level image writer as in claim 1 wherein said polarizing beamsplitters are prisms.

7. A two level image writer as in claim 1 wherein said polarizing beamsplitters are wire-grid polarizers.

8. A two level image writer as in claim 1 wherein said dichroic combiner is an x-cube.

9. A two level image writer as in claim 1 wherein said dichroic combiner is a combination of dichroic mirrors.

10. A two level image writer as in claim 1 wherein said first, second, and third light sources include respectively a red Light Emitting Diode (LED) array, a green LED array, and a blue LED array.

11. A two level image writer as in claim 1 wherein said first, second, and third light sources are selected from a group comprised of LED arrays, lasers, filtered white light sources, florescent sources, and vapor lamps.

12. A two level image writer as in claim 10 wherein a polarizer is located between each of said light sources and each of said polarizing beamsplitters.

13. A two level image writer as in claim 1 wherein said photosensitive media is a negative film.

14. A two level image writer as in claim 1 wherein said photosensitive media is an intermediate negative film.

15. A two level image writer as in claim 1 wherein said photosensitive media is a print film.

16. A two level image writer as in claim 1 wherein said photosensitive media is a reversal film.

17. A two level image writer as in claim 1 wherein said photosensitive media is a negative paper.

18. A two level image writer as in claim 1 wherein said photosensitive media is a reversal paper.

19. A two level image writer as in claim 1 wherein said photosensitive media is an electrophotographic media.

20. A two level image writer as in claim 1 wherein said first, second, and third light beam is maintained in s-polarization to match a required polarization of said combiner and utilize a high contrast side of said polarization beamsplitting prisms.

21. A two level imaging apparatus comprising:
a first light source on a first level for generating a first light beam;
a first polarizer on said first level for converting said first light beam into an S-polarization state;
a first reflecting mirror which reflects said first polarized light beam to a first polarizing beamsplitter located on a second level;
wherein said first polarizing beamsplitter reflects said S-polarized light to a first spatial light modulator located on said second level;

wherein said first spatial light modulator rotates a portion of said S-polarized light beam according to first data input to create a first imaging beam, and reflects said first imaging beam;

wherein said first imaging beam is transmitted through said first polarization beamsplitter to an x-cube located on said second level; and

wherein said first imaging beam is directed through said x-cube to an imaging plane.

22. A two level imaging apparatus as in claim 21 wherein a second light source on said first level generates a second light beam;

a second polarizer on said first level converts said second light beam into a S-polarization state;

a second reflecting mirror which reflects said second polarized light beam to a second polarizing beamsplitter located on said second level;

wherein said second polarizing beamsplitter reflects said S-polarized light to a second spatial light modulator located on said second level;

wherein said second spatial light modulator rotates a portion of said S-polarized light beam according to a second data input to create a second imaging beam and reflects said second imaging beam;

wherein said second imaging beam is transmitted through said second polarization beamsplitter to said x-cube; and

wherein said x-cube directs said second imaging beam to said imaging plane.

23. An imaging apparatus improvements therein comprising:
a first, second, and third illumination system located on a first level; and

a first, second, and third spatial light modulator located on a second level.

24. An imaging apparatus as in claim 23 wherein highly polarized light beams produced by said first, second, and third illumination systems are directed to facets of first, second and third polarization beamsplitters which results in highly polarized imaging beams.

25. A two level projection system comprising:
an illumination system in a first level for providing incident light beams, said illumination system comprising:

- a first source for emitting a first polarized light beam having a first color;
- a second source for emitting a second polarized light beam having a second color;
- a third source for emitting a third polarized light beam having a third color;
- fold mirrors for directing each beam to a second level;

three polarizing beamsplitters on said second level which receive said polarized beams from said fold mirrors, wherein each polarizing beamsplitter isolates polarization states of each of said first, second, and third polarized light beams;

three spatial light modulators on said second level, each comprising an array of pixel sites, wherein each pixel site modulates said first, second, and third polarized light beam from said polarizing beamsplitter prisms to form an array of image pixels according to said digital data; and

a dichroic combiner for combining said three modulated light beams into a single writing beam.

26. A method for forming an image from digital data onto an image plane comprising:

- emitting a first polarized light beam having a first color from a first source located on a first level;

emitting a second polarized light beam having a second color from a second source located on said first level;
emitting a third polarized light beam having a third color from a third source located on said first level;
directing each of said polarized beams to a second level;
isolating polarization states of each of said first, second, and third polarized light beams;
modulating said first, second, and third polarized light beam to form modulated light beams; and
combining said three modulated light beams into a single beam for producing said image at said image plane.

27. A two level image apparatus for forming an image from digital data onto an image plane, said apparatus comprising:
- an illumination system in a first level for providing incident light beams, said illumination system comprising:
 - a first source for emitting a first polarized light beam having a first color;
 - a second source for emitting a second polarized light beam having a second color;
 - a third source for emitting a third polarized light beam having a third color;
 - fold mirrors for directing each beam to a second level;
 - two polarizing beamsplitters on said second level which receive said polarized beams from said fold mirrors, wherein each polarizing beamsplitter isolates polarization states of each of said first and second polarized light beams;
 - two spatial light modulators on said second level, each comprising an array of pixel sites, wherein each pixel site modulates said first and

second polarized light beams from said polarizing beamsplitter prisms to form an array of image pixels according to said digital data; and

a dichroic combiner for combining said modulated light beams into a single writing beam.

28. A two level image apparatus for forming an image from digital data onto an image plane, said apparatus comprising:

an illumination system in a first level for providing incident light beams, said illumination system comprising:

a first source for emitting a first light beam having a first color;

a second source for emitting a second light beam having a second color;

a third source for emitting a third light beam having a third color;

fold mirrors for directing each beam to a second level;

three spatial digital micro mirror devices on said second level, each comprising an array of pixel sites, wherein each pixel site modulates said first, second, and third polarized light beam to form an array of image pixels according to said digital data; and

a dichroic combiner for combining said three modulated light beams into a single writing beam.

29. A two level image apparatus for forming an image from digital data onto an image plane, said apparatus comprising:

an illumination system in a first level for providing incident light beams, said illumination system comprising:

a first source for emitting a first polarized light beam having a first color;

a second source for emitting a second polarized light beam having a second color;

a third source for emitting a third polarized light beam having a third color;
reflecting devices for directing each beam to a second level;

three polarizing beamsplitters on said second level which receive beams from said reflecting devices, wherein each polarizing beamsplitter isolates polarization states of each of said first, second and third polarized light beams;

three spatial light modulators on said second level, each comprising an array of pixel sites, wherein each pixel site modulates said first, second, and third polarized light beam to form an array of image pixels according to said digital data; and

a dichroic combiner for combining said three modulated light beams into a single writing beam.

30. A two level image writer as in claim 29 wherein said reflecting devices are prisms.

31. A two level image apparatus for forming an image from digital data onto an image plane, said apparatus comprising:

an illumination system in a first level for providing incident light beams, said illumination system comprising:

a first source for emitting a first polarized light beam having a first color;
a second source for emitting a second polarized light beam having a second color;
a third source for emitting a third polarized light beam having a third color;
reflecting devices for directing each beam to a second level;

three polarizing beamsplitters on a second level which receive polarized light beams from said first, second and third light sources

respectively, wherein each polarizing beamsplitter isolates polarization states of each of said first, second and third polarized light beams;

three spatial light modulators on said second level, each comprising an array of pixel sites, wherein each pixel site modulates said first, second, and third polarized light beam to form an array of image pixels according to said digital data; and

a dichroic combiner for combining said three modulated light beams into a single writing beam.

32. A two level image writer as in claim 1 wherein a first, second and third fold mirror directs said first, second and third polarized light beams respectively to said polarization beamsplitters.

33. A two level image writer as in claim 1 wherein said first, second and third sources are comprised of Light Emitting Diodes and polarizers.

34. A two level image apparatus for forming an image from digital data onto an image plane, said apparatus comprising:

an illumination system in a first level for providing incident light beams, said illumination system comprising:

a first source for emitting a first polarized light beam having a first color;

a second source for emitting a second polarized light beam having a second color;

a third source for emitting a third polarized light beam having a third color;

reflecting devices for directing each beam to a second level;

three polarizing beamsplitters on a second level which receive polarized light beams from said first, second and third light sources respectively, wherein each polarizing beamsplitter isolates polarization states of each of said first, second and third polarized light beams;

three spatial light modulators on said second level, each comprising an array of pixel sites, wherein each pixel site modulates said first, second, and third polarized light beam to form an array of image pixels according to said digital data; and

a dichroic combiner for combining said three modulated light beams into a single writing beam.

35. An imaging apparatus improvements therein comprising:
first, second, and third illumination systems located on a first level, and
first, second, and third polarization beamsplitters located on a second level.